

## ABSTRACT OF THE DISCLOSURE

A semiconductor source of emission electrons which uses a target of a wide bandgap semiconductor having a target thickness measured from an illumination surface to an emission surface. The semiconductor source is equipped with an arrangement for producing and directing a beam of seed electrons at the illumination surface and a mechanism for controlling the energy of the seed electrons such that the energy of the seed electrons is sufficient to generate electron-hole pairs in the target. A fraction of these electron-hole pairs supply the emission electrons. Furthermore, the target thickness and the energy of the seed electrons are optimized such that the emission electrons at the emission surface are substantially thermalized. The emission of electrons is further facilitated by generating negative electron affinity at the emission surface. The source of the invention can take advantage of diamond, AlN, BN,  $\text{Ga}_{1-y}\text{Al}_y\text{N}$  and  $(\text{AlN})_x(\text{SiC})_{1-x}$ , wherein  $0 \leq y \leq 1$  and  $0.2 \leq x \leq 1$  and other wide bandgap semiconductors.

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